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SOLAR/2041-79/06

Monthly Performance Report

HOWARD'S GROVE SCHOOL

JUNE 1979



U.S. Department of Energy

National Solar Heating and
Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT
HOWARDS GROVE SCHOOL
JUNE 1979

I. SYSTEM DESCRIPTION

This solar energy heating system is designed to provide 58 percent of the space heating for an addition to the North View Elementary School in Howards Grove, Wisconsin. The addition contains 12,330 square feet of heated space. The collector array has a total of 138 collector panels arranged in six rows, each row containing 23 flat-plate air collector panels. The array panels, manufactured by Sun Stone Solar Energy Equipment, have a gross area of 2,685 square feet. The collectors face south at an angle of 50 degrees from the horizontal. Air is the medium used for transferring energy from the collector array to storage. Solar energy is stored in a 16- by 21- by 6-foot concrete block bin containing 1,500 cubic feet of crushed rock located below the equipment room. When solar energy is inadequate to provide space heating, auxiliary thermal energy is supplied from a 397,200 Btu/hr fuel-oil boiler. The space heating control system modulates control dampers to mix outside air, return air and thermally heated air (solar and auxiliary) to maintain a building temperature of 67°F during the day and 55°F at night. A minimum of 10 percent fresh outside air is required by law to be mixed with return air.

This system, shown schematically in Figure 1, has three modes of operation.

Mode 1 - Collector-to-Storage: This mode is entered when the collector array outlet temperature exceeds the temperature at the bottom of rock thermal storage by at least 17°F. Air is drawn from the collector array, using the collector circulating fan F2, into the rock thermal storage and recirculated to the collectors. This mode continues until the collector outlet temperature no longer exceeds the temperature in the bottom of rock thermal storage by at least 4°F.

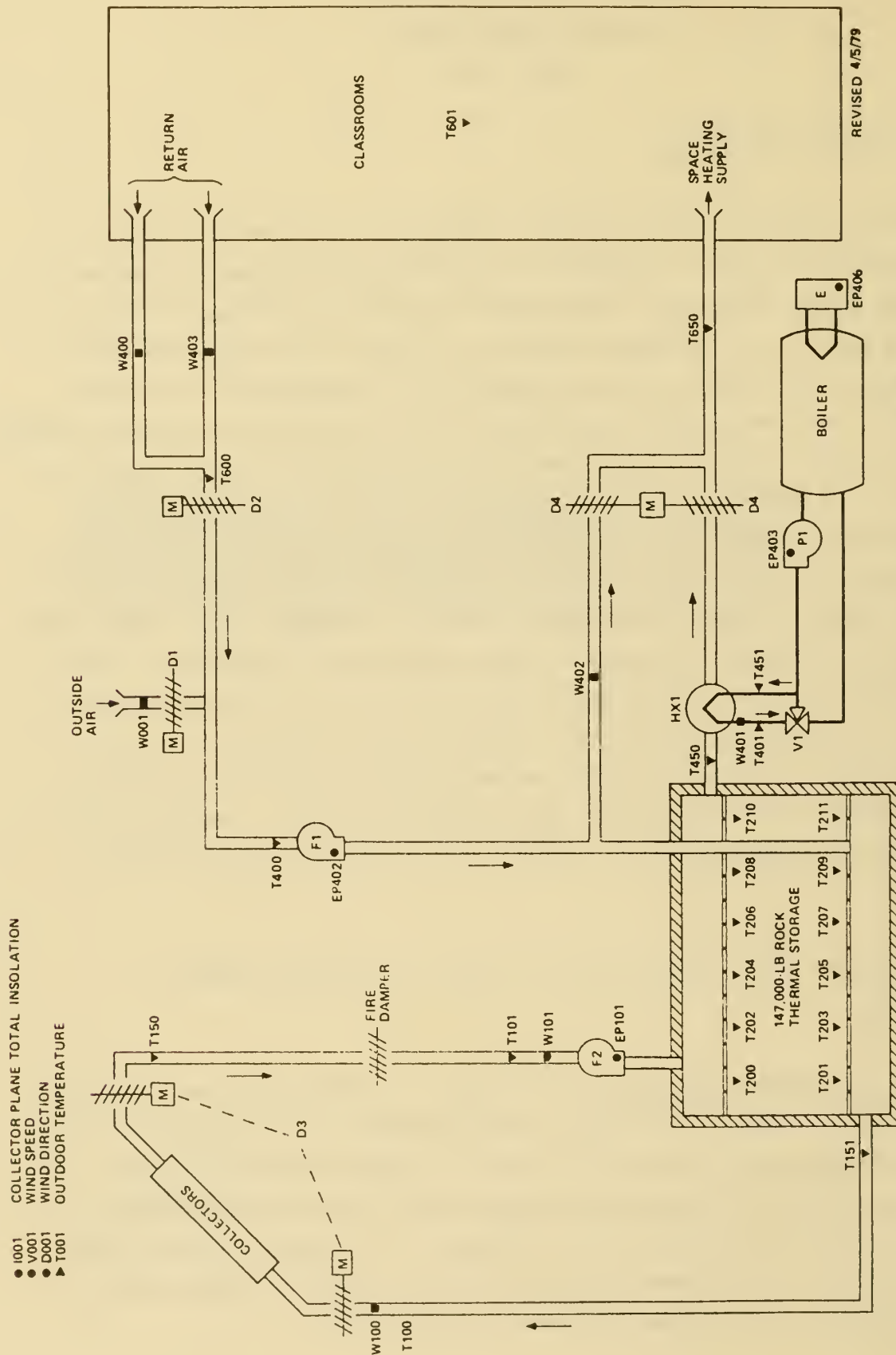


Figure 1. HOWARDS GROVE SCHOOL SOLAR ENERGY SYSTEM SCHEMATIC

Mode 2 - Storage-to-Classrooms (Occupied): This mode is entered at the beginning of each school day as determined by a seven-day clock timer. Circulation fan F1 runs continuously to transfer energy from storage, to classrooms, and to provide ventilation. Outside air and return air dampers are modulated to supply fresh air at a mixed return air temperature of 60°F. Multizone control dampers modulate the mixed return air with thermally heated air from storage to maintain the space heating system supply air temperature. The auxiliary fuel-oil boiler supplements solar energy to meet the space heating demand, and to maintain the building's indoor ambient temperature. The seven-day clock timer terminates this mode at the end of each school day. The clock timer may be manually overridden to provide Mode 2 heating for irregularly scheduled (outside normal class hours) school events.

Mode 3 - Storage-to-Classrooms (Unoccupied): This mode is entered when there is a demand for space heating and the system is not in the Occupied mode. The outside air damper D1 is closed. Circulating fan F1 runs when a space heating demand exists to transfer energy from storage to classrooms, and to provide ventilation. Multizone control dampers modulate the return air with thermally heated air from storage to maintain the space heating system supply temperature. The auxiliary fuel-oil boiler supplements solar energy to meet the space heating demand and to maintain the building's indoor ambient temperatures. This mode terminates when either the demand for space heating ceases, or the system is changed to the Occupied mode.

Mode 1 operation can occur while either Mode 2 or 3 is active.

II. PERFORMANCE EVALUATION

The system performance evaluations discussed in this section are based primarily on the analysis of the data presented in the attached computer-generated monthly report. This attached report consists of daily site thermal and energy values for each subsystem, plus environmental data. The performance factors discussed in this report are based upon the

definitions contained in NBSIR 76-1137, Thermal Data Requirements and Performance Evaluation Procedures for the National Solar Heating and Cooling Demonstration Program.

A. Introduction

The solar energy system at the Howards Grove School site operated continuously during the month of June. The system supplied 85 percent of the indicated space heating demand of 3.36 million Btu. Operation of the solar energy system resulted in a savings of 3.75 million Btu of fossil fuel (26 gallons of fuel oil) at an expense of 3.45 million Btu (1,010 kwh) of electrical energy.

B. Weather

May weather conditions were near normal. The measured outside ambient temperature was 63°F, which is 2°F lower than the 65°F predicted from long-term averages. The measured wind velocity was 4 mph, less than the 10.8 mph predicted from long-term averages. The long-term average environmental conditions were obtained from the environmental data listed in Climatography of the United States No. 81 (By State).

The cloud cover was below normal, as indicated by the measured insolation of 1,608 Btu/ft²-day. The predicted long-term monthly insolation was 1,553 Btu/ft²-day; this is derived from an average of the data for Green Bay and Milwaukee, Wisconsin, as listed in SOLMET Volume 1 - User's Manual.

C. System Thermal Performance

Collector - Of the 129.54 million btu of solar energy incident on the collector array during May, 107.89 million Btu were incident on the array when fan F2 was operating. The system collected 32.55 million

Btu, or 25 percent of the total insolation incident on the collector array. However, the collected energy represents 30 percent of the operational incident energy. The operation of the collector circulating fan F2 required 1.30 million Btu of electrical energy.

Storage - From the indicated 32.55 million Btu of solar energy collected, 32.46 million Btu were delivered to rock thermal storage. A total of 2.85 million Btu was extracted from storage and delivered to the space heating subsystem. Storage lost 28.78 million Btu of solar energy which results in a storage efficiency of only 11 percent.

Space Heating Load - The space heating load was near normal because the average monthly temperature of 63°F was near the 65°F predicted long-term average for June. The 100 heating degree-days measured at the site is above the 91 heating degree-days predicted from long-term averages.

The measured space heating demand of 3.36 million Btu was satisfied by 2.85 million Btu of solar energy and 0.51 million Btu of auxiliary thermal energy, resulting in a solar fraction of 85 percent. The 0.51 million Btu of auxiliary thermal energy for space heating were supplied by the consumption of 0.67 million Btu of fuel oil. This amounted to 5 gallons of fuel oil.

The analysis of the performance of storage revealed that the large circulating fan added energy to the building circulation air flow. This added energy produced a 1.5°F temperature rise across the circulation fan and, thus, contributed to satisfying the space heating demand. The magnitude of the induced energy amounted to 1.05 million Btu during June.

D. Observations

The space heating load for June is nearly the minimum monthly load. Consequently, the solar fraction can be expected to be quite high, and this is considered in the reported data. In addition, the losses from the rock bin probably moderated the active heating requirements.

E. Energy Savings

The solar energy system installed in Howards Grove School resulted in an indicated savings of 3.75 million Btu (26 gallons) of fuel oil during June at an expense of 3.45 million Btu (1,010 kwh) of electrical operating energy. The space heating energy savings calculations are based on the energy requirements of a conventional propane-fired furnace with an efficiency of 76 percent compared to the energy requirements of the solar energy system.

The actual solar energy system savings must include not only the direct solar contribution from the rock thermal storage, but also the thermal loss contribution to the space heating demand. In addition, the fan energy contribution should be considered an auxiliary contribution to the space heating demand. When these additional energy contributions are considered, the savings become 41.62 million Btu (288 gallons) of fuel oil.

III. ACTION STATUS

Additional instrumentation is being suggested to resolve the discrepancy between space heating demand measured by different instrumentation sensor sets. This would allow a more accurate determination of solar energy contribution and identify the source of the faulty sensor indications.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SOLAR/2041-79/06

SITE: HOWARDS GROVE SCHCL, HOWARDS GROVE, WIS
REPORT PERIOD: JUNE, 1979

SITE/SYSTEM DESCRIPTION:
THE HOWARD GROVE SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING FOR A
12,330 SQUARE FOOT ADDITION TO THE NORTHVIEW ELEMENTARY SCHOOL
IN HOWARDS GROVE, WIS. THE SYSTEM USES AIR AS THE ENERGY TRANSFER
MEDIUM, 2685 SQUARE FEET OF COLLECTORS, TO COLLECT AND STORE SOLAR
ENERGY IN A 1500 CU. FT. ROCK STORAGE UNIT. RETURN AIR FROM THE SCHOOL
IS DIRECTED THROUGH THE ROCK UNIT FOR SPACE HEATING. AUXILIARY HEAT IS
PROVIDED BY AN IN-DUCT FUEL SUPPLIED BY A FUEL OIL BOILER.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	129.542	MILLION BTU
COLLECTED SOLAR ENERGY	48238	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	32.551	MILLION BTU
AVERAGE BUILDING TEMPERATURE	12121	BTU/SQ.FT.
ECSS SOLAR CONVERSION EFFICIENCY	63	DEGREES F
ECSS OPERATING ENERGY	72	DEGREES F
TOTAL SYSTEM OPERATING ENERGY	0.02	MILLION BTU
TOTAL ENERGY CONSUMED	1.301	MILLION BTU
	3.766	MILLION BTU
	36.986	MILLION BTU

SUBSYSTEM SUMMARY:

LOAD			
SOLAR FRACTION		SYSTEM TOTAL	
SOLAR ENERGY USED		3.361	MILLION BTU
OPERATING ENERGY		85	PERCENT
AUX. THERMAL ENERGY		2.852	MILLION BTU
AUX. ELECTRIC FUEL		3.766	MILLION BTU
AUX. FOSSIL FUEL		0.509	MILLION BTU
ELECTRICAL SAVINGS		N.A.	MILLION BTU
FOSSIL SAVINGS		0.669	MILLION BTU
		-3.446	MILLION BTU
		3.753	MILLION BTU

SYSTEM PERFORMANCE FACTOR:

0.254

- * DENOTES UNAVAILABLE DATA
- @ DENOTES NULL DATA
- N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT
OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978,
SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT SITE SUMMARY

SITE: HOWARDS GROVE SCHOOL, HOWARDS GROVE, WIS
REPORT PERIOD: JUNE, 1979
SCLAR/2041-79/06

SITE/SYSTEM DESCRIPTION:
THE HOWARD GROVE SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING FOR A 12,330 SQUARE FOOT ADDITION TO THE NORTHVIEW ELEMENTARY SCHOOL IN HOWARDS GROVE, WIS. THE SYSTEM USES AIR AS THE ENERGY TRANSFER MEDIUM, 2685 SQUARE FEET OF COLLECTORS, TO COLLECT AND STORE SOLAR ENERGY IN A 1500 CU. FT. ROCK STORAGE UNIT. RETURN AIR FROM THE SCHOOL IS DIRECTED THROUGH THE ROCK UNIT FOR SPACE HEATING. AUXILIARY HEAT IS PROVIDED BY AN IN-DUCT EX SUPPLIED BY A FUEL OIL BOILER.

GENERAL SITE DATA:
INCIDENT SOLAR ENERGY 136.667 GIGA JOULES
COLLECTED SOLAR ENERGY 547787 KJ/SQ.M.
34.341 GIGA JOULES
AVERAGE AMBIENT TEMPERATURE 137646 KJ/SQ.M.
AVERAGE BUILDING TEMPERATURE 17 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY 22 DEGREES C
ECSS OPERATING ENERGY 0.02 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY 1.373 GIGA JOULES
TOTAL ENERGY CONSUMED 3.973 GIGA JOULES
39.020 GIGA JOULES

SUBSYSTEM SUMMARY:
LOAD N.A.
SOLAR FRACTION N.A.
SOLAR ENERGY USED N.A.
OPERATING ENERGY N.A.
AUX. THERMAL ENG N.A.
AUX. ELECTRIC FUEL N.A.
AUX. FOSSIL FUEL N.A.
ELECTRICAL SAVINGS N.A.
FOSSIL SAVINGS N.A.
HEATING 3.546
COOLING N.A.
SYSTEM TOTAL 3.546 GIGA JOULES
85 PERCENT
3.009 GIGA JOULES
3.973 GIGA JOULES
0.537 GIGA JOULES
N.A. GIGA JOULES
0.706 GIGA JOULES
-3.636 GIGA JOULES
3.960 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.254
* DENOTES UNAVAILABLE DATA
2 DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA
REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT
OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978.
SCLAR/0004-78/18

SCLAR HEATING AND CCLING DEMONSTRATION PROGRAM

MONTHLY REPCRT ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SOLAR/2041-79/06

SITE: HOWARDS GROVE SCHOOL, HOWARDS GROVE, WIS
REPCRT PERIOD: JUNE, 1979

DAY OF MONTH	INCIDENT SCLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TC LOADS MILLION BTU	AUX THERMAL TC ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	5.420	62	C.175	NCT	0.055	NCT	0.033
2	5.224	66	0.000		0.048		0.000
3	5.277	72	C.000		0.045		0.000
4	2.430	67	C.079		0.017		0.032
5	*	*	*		*		*
6	2.484	60	0.239	APPLICABLE	0.039	APPLICABLE	0.096
7	2.775	67	0.112		0.034		0.040
8	1.781	65	C.101		0.033		0.057
9	2.113	59	0.003		0.039		0.002
10	1.669	59	C.000		0.004		0.000
11	5.865	61	0.334		0.055		0.057
12	5.640	56	0.153		0.056		0.034
13	5.671	61	0.160		0.057		0.028
14	5.132	69	0.137		0.055		0.027
15	*	*	*		*		*
16	*	*	*		*		*
17	5.206	64	C.000		0.038		0.000
18	5.637	57	0.019		0.046		0.003
19	5.622	64	C.036		0.054		0.006
20	4.075	68	0.075		0.039		0.018
21	4.173	72	C.057		0.058		0.014
22	1.127	56	C.172		0.006		0.152
23	4.925	52	C.000		0.049		0.000
24	5.886	54	C.000		0.056		0.040
25	6.285	61	0.249		0.066		0.035
26	6.153	73	C.218		0.048		0.015
27	4.456	66	C.067		0.051		0.007
28	5.052	63	C.036		0.026		0.058
29	1.774	60	0.103		0.050		0.000
30	4.731	65	C.000				
SUM	129.542	-	2.852	N.A.	1.301	N.A.	-
AVG	4.318	63	0.095	N.A.	0.043	N.A.	0.022
NBS ID	0001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
 & DENOTES NULL DATA.
 N.A. DENOTES NCT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT COLLECTOR ARRAY PERFORMANCE

SITE: HOWARDS GROVE SCHOOL, HOWARDS GROVE, WIS SOLAR/2041-79/06
REPORT PERIOD: JUNE, 1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	5.420	4.935	1.910	68	0.352
2	5.224	4.475	0.591	76	0.190
3	5.277	4.370	0.793	83	0.150
4	2.420	1.478	0.443	74	0.182
5	*	*	*	*	*
6	2.484	1.469	0.423	66	0.170
7	2.775	2.130	0.867	75	0.312
8	1.781	1.247	0.527	67	0.296
9	2.113	1.464	0.357	63	0.169
10	1.669	0.286	0.051	57	0.031
11	5.865	5.301	1.853	70	0.316
12	5.640	5.150	1.868	67	0.331
13	5.671	5.225	1.855	71	0.327
14	5.132	4.682	1.729	81	0.337
15	*	*	*	*	*
16	*	*	*	*	*
17	5.206	4.003	0.504	70	0.097
18	5.637	4.631	1.328	63	0.236
19	5.622	5.064	1.463	70	0.260
20	4.075	3.623	1.194	*	0.293
21	4.173	3.820	1.176	77	0.292
22	1.127	0.113	0.058	*	0.051
23	4.925	4.339	1.069	*	0.217
24	5.666	4.632	0.507	60	0.154
25	6.289	5.537	1.767	71	0.281
26	6.153	5.597	1.912	84	0.311
27	4.456	3.818	1.309	*	0.294
28	5.052	4.454	1.628	*	0.322
29	1.774	0.810	0.248	62	0.140
30	4.731	4.285	1.065	72	0.225
SUM	129.542	107.886	32.551	-	-
AVG	4.318	3.596	1.085	70	0.251
NESID	0001		0100		N100

* DENOTES UNAVAILABLE DATA.

@ DENOTES NULL DATA.

N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT STORAGE PERFORMANCE

SITE: HOWARDS GROVE SCHCCL, HOWARDS GROVE, WIS SOLAR/2041-79/06
 REPRCT PERIOD: JUNE, 1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	1.789	0.179	0.314	98	0.275
2	1.318	0.000	0.367	115	0.430
3	1.003	0.000	0.329	129	0.328
4	0.380	0.079	-0.858	117	-2.050
5	*	*	-0.004	*	*
6	0.479	0.239	-0.456	92	-0.454
7	0.811	0.112	0.007	89	0.146
8	0.496	0.101	-0.111	87	-0.019
9	0.487	0.003	0.167	89	0.349
10	0.063	0.000	0.004	92	0.060
11	1.836	0.334	0.285	95	0.337
12	1.801	0.193	0.048	100	0.134
13	1.713	0.160	0.077	102	0.138
14	1.525	0.137	0.147	106	0.186
15	*	*	0.229	*	*
16	*	*	0.568	*	*
17	0.597	0.000	0.052	133	0.088
18	1.204	0.019	-0.648	116	-0.523
19	1.376	0.036	-0.053	108	-0.013
20	1.044	0.075	-0.123	106	-0.046
21	1.061	0.057	-0.027	102	0.028
22	0.065	0.172	-0.734	89	-8.686
23	1.456	0.000	0.743	93	0.511
24	1.178	0.000	0.537	115	0.455
25	1.629	0.249	-0.365	112	-0.071
26	1.731	0.218	0.088	109	0.177
27	1.126	0.067	0.003	112	0.062
28	1.404	0.036	-0.023	111	0.009
29	0.242	0.103	-0.667	98	-2.330
30	1.447	0.000	0.735	104	0.510
SUM	32.463	2.852	0.832	-	-
AVG	1.082	0.095	0.028	104	0.114
NES ID	3200	G201	G202		N103

* DENOTES UNAVAILABLE DATA.
 @ DENOTES NULL DATA.
 N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT SPACE HEATING SUBSYSTEM

SITE: HOWARDS GROVE SCHOO, HOWARDS GROVE, WIS
REPORT PERIOD: JUNE, 1975

SOLAR/2041-79/06

DAY CF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR. OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT SAVINGS MILLION BTU	FOSSIL SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.209	85	0.179	0.171	0.020		0.042	-0.046	0.235	72	62
2	0.000		0.000	0.000	0.000		0.000	-0.000	0.000	71	66
3	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	72	72
4	0.079	100	0.079	0.088	0.000		0.000	-0.088	0.104	73	67
5	*	*	*	*	*		*	*	*	*	*
6	0.239	100	0.239	0.149	0.000		0.000	-0.149	0.314	73	60
7	0.115	97	0.112	0.134	0.003		0.004	-0.133	0.147	73	67
8	0.135	75	0.101	0.109	0.033		0.044	-0.065	0.123	73	65
9	0.095	3	0.003	0.012	0.051		0.120	-0.000	0.004	71	59
10	0.080		0.000	0.011	0.080		0.106	-0.001	0.000	69	59
11	0.479	70	0.334	0.194	0.145		0.191	-0.111	0.439	70	61
12	0.267	72	0.193	0.175	0.074		0.097	-0.162	0.254	71	56
13	0.160	100	0.160	0.129	0.000		0.000	-0.129	0.210	72	61
14	0.137	100	0.137	0.112	0.000		0.000	-0.113	0.180	73	69
15	*	*	*	*	*		*	*	*	*	*
16	*	*	*	*	*		*	*	*	*	*
17	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	73	64
18	0.019	100	0.019	0.037	0.000		0.000	-0.037	0.025	73	57
19	0.036	100	0.036	0.036	0.000		0.000	-0.036	0.048	73	64
20	0.075	100	0.075	0.070	0.000		0.000	-0.070	0.099	74	68
21	0.057	100	0.057	0.041	0.000		0.000	-0.041	0.075	74	72
22	0.172	100	0.172	0.161	0.000		0.000	-0.161	0.226	73	56
23	0.000	0	0.000	0.019	0.000		0.000	-0.019	0.000	70	52
24	0.000	0	0.000	0.013	0.000		0.000	-0.013	0.000	70	54
25	0.249	100	0.249	0.150	0.000		0.000	-0.150	0.328	72	61
26	0.218	100	0.218	0.165	0.000		0.000	-0.166	0.287	73	73
27	0.067	100	0.067	0.065	0.000		0.000	-0.065	0.088	74	66
28	0.036	100	0.036	0.045	0.000		0.000	-0.049	0.047	74	62
29	0.103	100	0.103	0.103	0.000		0.000	-0.108	0.135	73	60
30	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	72	65
SUM	3.361	-	2.852	2.465	0.509	N.A.	0.669	-2.145	3.753	-	-
AVG	0.112	85	0.095	0.082	0.017	N.A.	0.022	-0.072	0.125	72	63
NBS	0402	N40C	G400	G403	G401		G410	G415	G417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SCLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT ENVIRONMENTAL SUMMARY

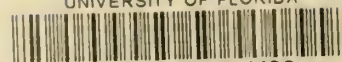
SITE: HCWARDS GROVE SCHOOL, HCWARDS GROVE, WIS
REPORT PERIOD: JUNE, 1979

SCLAR/2041-79/06

DAY OF MONTH	TOTAL INSCLATION BTU/SQ.FT	DIFFUSE INSCLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	2018	NCT	62	68	NOT	300	5
2	1945		66	76		256	4
3	1565		72	83		237	4
4	905		67	74		245	8
5	*		*	*		*	*
6	925		60	66	APPL	163	3
7	1033		67	75	ICAB	174	3
8	663		65	67	LE	0	1
9	787		59	63		31	8
10	622		59	57		287	3
11	2184		61	70		306	5
12	2100		56	67		0	1
13	2112		61	71		148	3
14	1911		69	81		159	*
15	*		*	*		*	*
16	*		*	*		*	*
17	1938		64	70		360	8
18	2099		57	63		47	6
19	2094		64	70		141	9
20	1517		68	*		172	8
21	1554		72	77		262	9
22	420		56	*		0	1
23	1834		52	*		23	4
24	2192		54	60		56	2
25	2742		61	71		148	7
26	2291		73	84		233	8
27	1659		66	*		0	2
28	1881		63	*		0	1
29	661		60	62		36	2
30	1762		65	72		8	2
SUM	48238	N.A.	-	-	-	-	-
AVG	1608	N.A.	63	70	N.A.	*	4
NBS ID	G001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
 & DENOTES NULL DATA.
 N.A. DENOTES NOT APPLICABLE DATA.

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